RADIO SHACK LIMITED WARRANTY

This product is warranted against defects for 90 days from date of purchase from Radio Shack company-owned stores and authorized Radio Shack franchisees and dealers. Within this period, we will repair it without charge for parts and labor. Simply **bring your Radio Shack sales slip** as proof of purchase date to any Radio Shack store. Warranty does not cover transportation costs. Nor does it cover a product subjected to misuse or accidental damage.

EXCEPT AS PROVIDED HEREIN, RADIO SHACK MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

We Service What We Sell

RADIO SHACK
A Division of Tandy Corporation
Fort Worth, Texas 76102

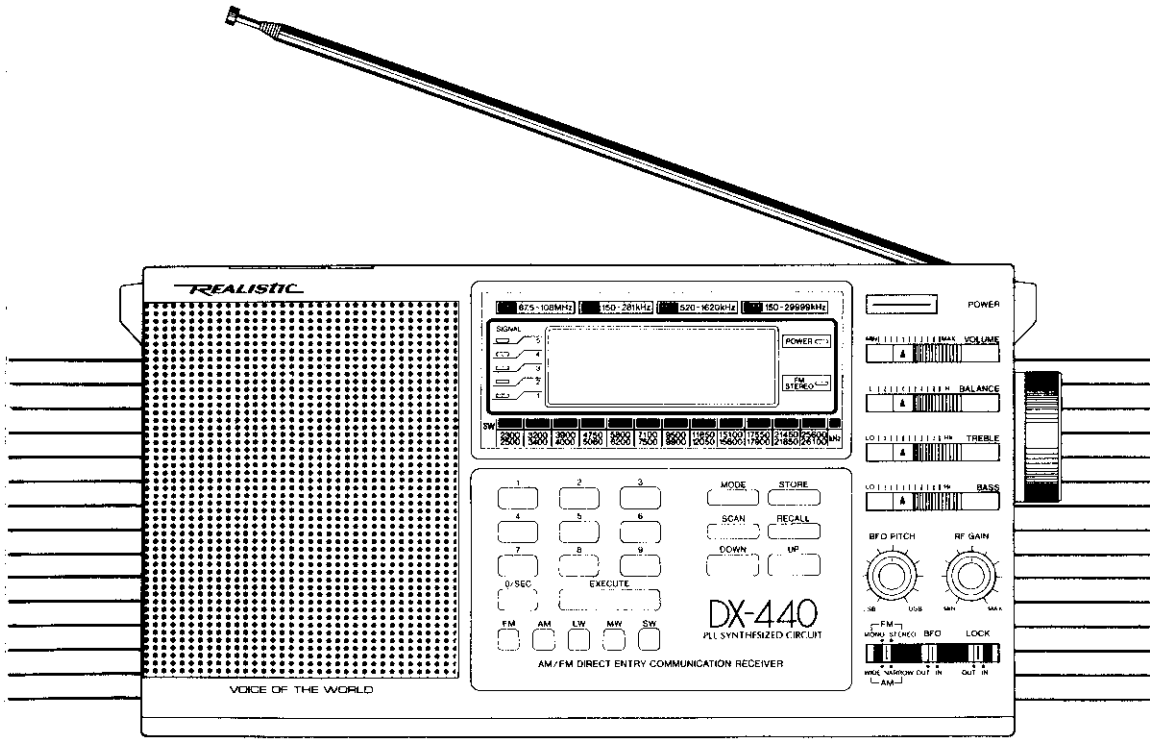
12A7

Printed in Taiwan

DX-440

OWNER'S MANUAL AM/FM DIRECT ENTRY COMMUNICATIONS RECEIVER

Please read before using this equipment



Cat. No. 20-221A

REALISTIC®

CONTENTS

INTRODUCTION

You now have the world at your fingertips. Just press the buttons of your DX-440 to listen to a variety of voices from around the world. In addition to your local AM and FM broadcast stations, you can now enjoy broadcasts from London, Tokyo, Paris, Berlin, and Moscow.

This entertainment grade, general purpose, communications receiver covers an extremely wide range of frequencies that also include shortwave and special services such as marine and navigation. If you understand international Morse code, you can listen in and decode a wide variety of transmissions.

The radio uses the latest solid-state technology to provide programming, a large liquid crystal display (LCD), and a host of other convenient features. Because this product is so versatile, please take a few minutes to review the material in this manual before you proceed. You'll enjoy the radio much more if you do.

Welcome to the world of the shortwave listener.

For your own protection, we urge you to record the serial number of this unit in the space provided below. The serial number is located inside of the battery compartment

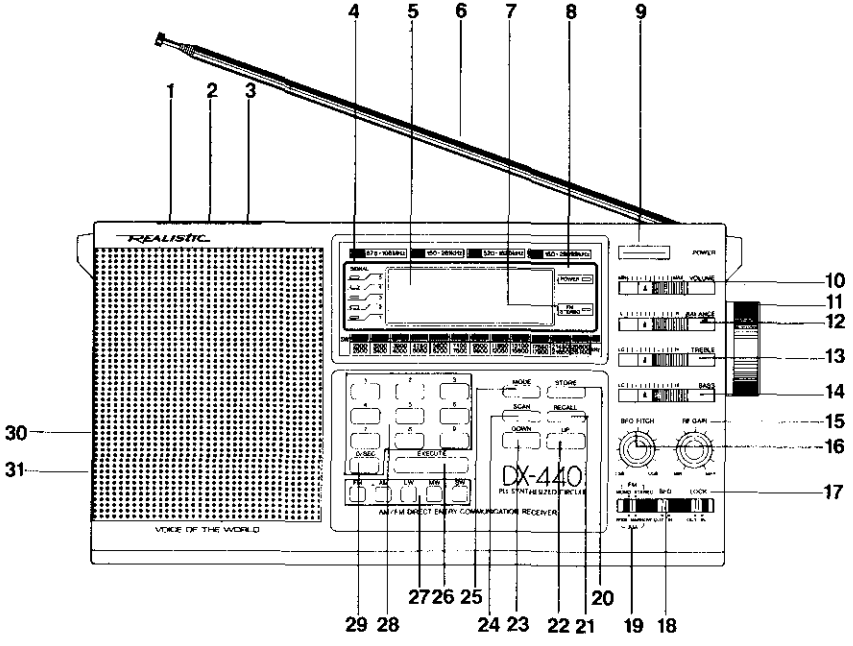
Serial Number_____

FEATURES

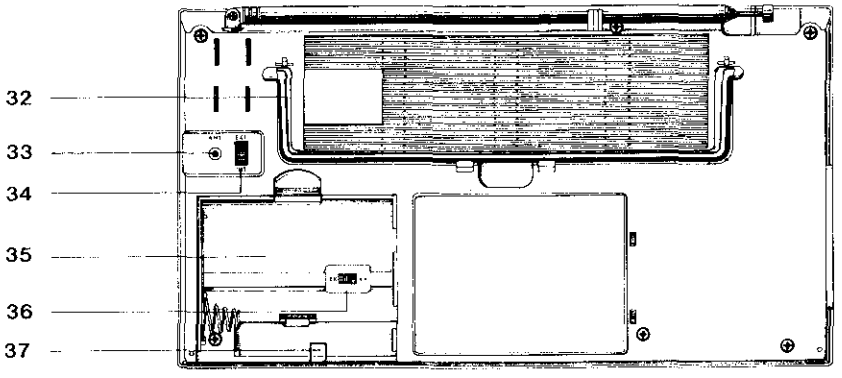
- **Wide Tuning Range**—lets you receive more stations from more places than ever before.
- **Fast Response LCD**—shows you the frequency you select in large, easy-to-read numbers.
- **Direct Access Keypad**—lets you instantly tune in any desired frequency from 87.5 to 108 MHz on the FM band and from 150 kHz to 29,999 kHz on the AM band.
- **Up to 9 Storable Frequencies**—give you instant response for your favorite stations or transmission sources.
- **Multiple Power Source Operation**—means you can use it virtually anywhere in the world.
- **Supplemental Tuning Controls**—allow adjustment for maximum clarity of the selected frequency.
- **Dual Function Mode Switch**—allows you to display the frequency or the time on the LCD panel.
- **Scanning Control**—lets you check the various transmissions on a certain band and lock on to the chosen frequency.
- **Full Range Tone Controls**—lets you customize the sound for clarity and listening comfort.
- **Stereo Headphones Jack**— lets you listen to FM Stereo programs in full stereo.

CONTROL LOCATIONS

1. LIGHT Button
2. TIMER Button
3. SLEEP Button
4. SIGNAL Strength Indicators
5. LCD Display
6. Telescopic Antenna
7. FM STEREO Indicator
8. POWER On Indicator
9. POWER Switch
10. VOLUME Control
11. Dual-Function Tuning Control
12. BALANCE Control
13. TREBLE Control
14. BASS Control
15. RF GAIN Control
16. BFO PITCH Control
17. LOCK Switch
18. BFO OUT/IN Switch
19. FM/(MONO/STEREO)/AM(WIDE/NARROW) Mode Selector
20. STORE Button
21. RECALL Button
22. UP Button
23. DOWN Button
24. SCAN Button
25. MODE Button
26. EXECUTE Button
27. Band Selectors
28. Number Entry Buttons
29. Time Mode/SEConds Reset button
30. STEREO headPHONES Jack (3.5mm)
31. DC IN 9V Jack



32. Folding Stand
33. EXTernal Antenna Jack
34. EXTernal/INTernal Antenna Selector
35. Battery Compartment
36. 9k/10kHz Step Switch (beneath batteries)
37. Battery Removal Strap



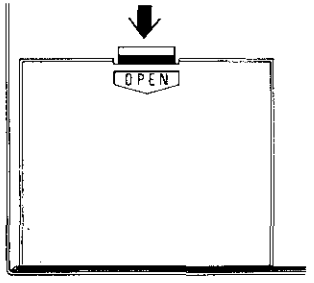
CHOOSING A POWER SUPPLY

You can operate the DX-440 using:

- Six alkaline D batteries and two AA batteries.
- Household AC (with an optional AC adapter)
- A 12-Volt DC automotive battery (with an optional DC adapter)

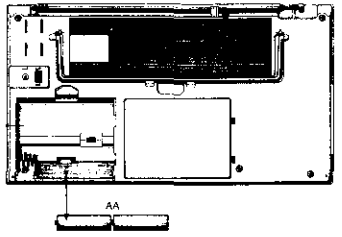
INSTALLING BATTERIES

1. Press the latch on the battery compartment cover in the direction of the OPEN label, and lift the cover off.

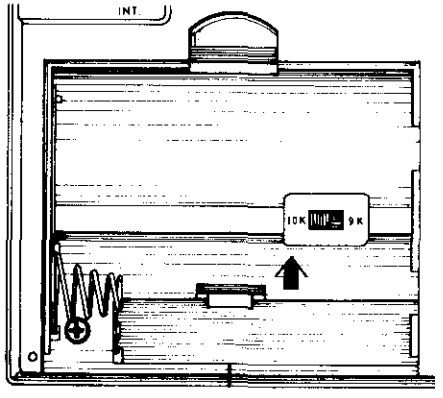


2. Insert two AA alkaline batteries (such as Radio Shack® Cat. No.23-552) in the smaller battery chamber within the main compartment. Position them as illustrated on the back of the radio.

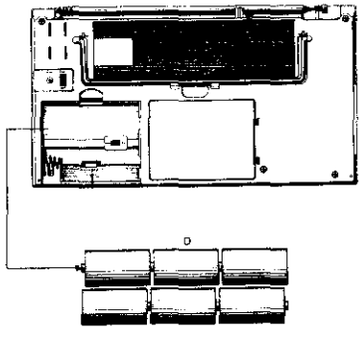
   (Place these batteries and the next set of batteries on top of their respective battery removal ribbons so that you can lift them easily for replacement.)



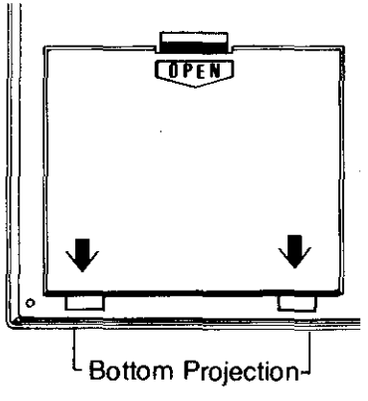
Note: Before installing the next set of batteries, verify that the frequency step selector switch is set to the position correct for your country. In the USA, move the switch to the 10K position. In other countries, set it to 9K.



3. Insert six D batteries in the main battery compartment. Position them as shown in the illustration on the back of the radio. For best results, use alkaline batteries such as Radio Shack® Cat. No. 23-550.



4. Insert the bottom projections on the edge of the battery compartment cover inside the lower edge of the compartment opening. Lower the cover, and snap the top latch down until it clicks closed.

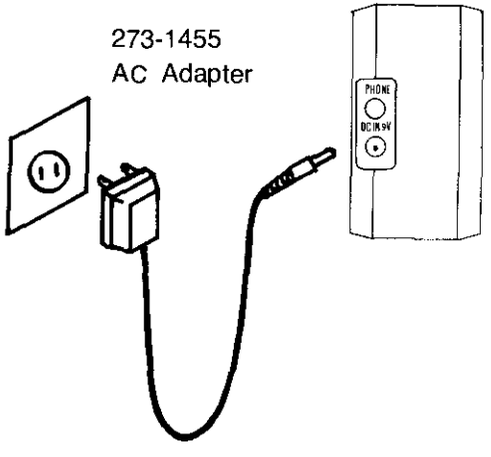


USING HOUSEHOLD AC

You can power the DX-440 from household AC using an optional AC adapter, Cat. No. 273-1455. Plug the small connector of the adapter into the DC IN 9V socket on the side of the unit. Plug the adapter into a standard household outlet.

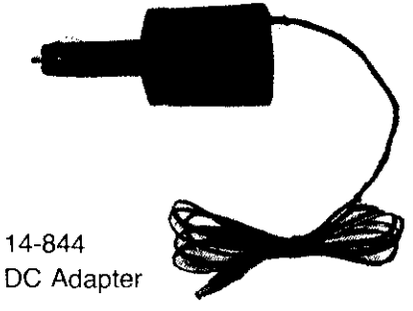
Note: When you use AC, the DX-440 automatically disconnects the internal batteries.

273-1455
AC Adapter



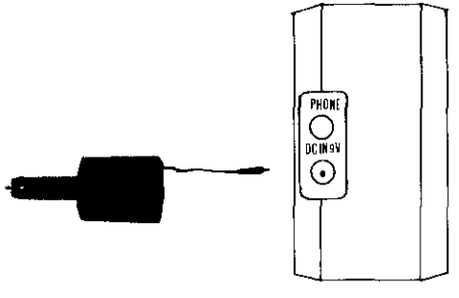
USING AN AUTOMOTIVE BATTERY

You can operate the DX-440 in a car, boat, or recreational vehicle that is equipped with a 12 Volt DC, negative ground battery. Use a DC adapter (Cat. No. 14-844).



14-844
DC Adapter

Insert the adapter plug into the jack marked DC IN 9V on the side of the DX-440. Plug the other end of the adapter into the lighter socket of the vehicle.



Note: When you connect the adapter, the DX-440 automatically disconnects the internal batteries.

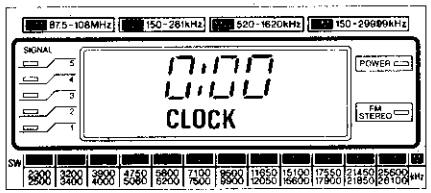
Caution: Do not let the adapter's barrel plug contact any metal parts of the vehicle when the adapter is plugged into the lighter socket of the vehicle but not yet plugged into the DX-440. A harmful short can occur that can damage the adapter or the vehicle's electrical system.

SETTING THE CLOCK

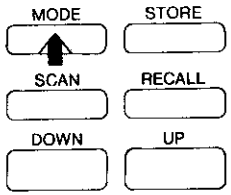
The display shows the time in a 24-hour mode except when you are tuning a station or performing some other operation. The radio uses the 24-hour mode because most shortwave stations schedule their broadcasts on the basis of Greenwich Mean Time which is a 24-hour clock.

The clock starts when you install the two AA batteries. The display shows CLOCK 0:00.

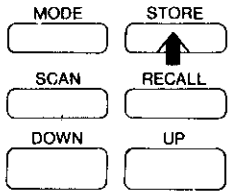
Note: If after installing the two AA batteries the display does not show CLOCK 0:00, remove the batteries and install them one minutes later. The display will show CLOCK 0:00 .



1. Press the MODE button.

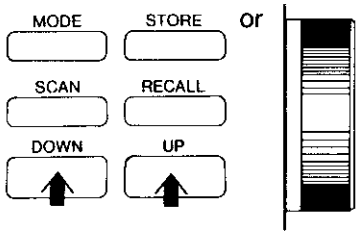


2. Press the STORE button. CLOCK flashes in the display for five seconds.



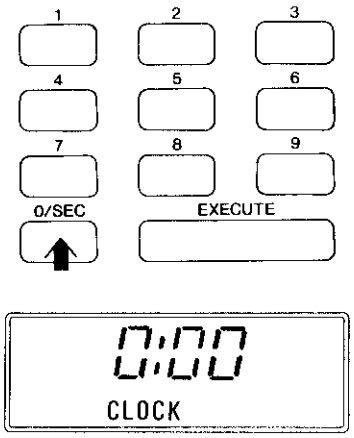
3. During this period press the UP or DOWN buttons to reach the correct time in hours and minutes (or, rotate the tuning knob to quickly reach the correct setting).

Note: digit of time can be adjusted only when "CLOCK" is flashing in the display.



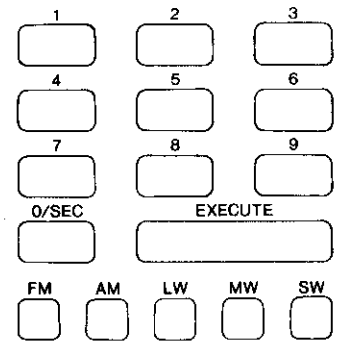
4. Press the O/SEC button. The display shows the minutes and seconds setting. Press the STORE button to reset the seconds to 00 and the display, return to the hours and minutes.

Note: When "CLOCK" is flashing, O/SEC button does not function.



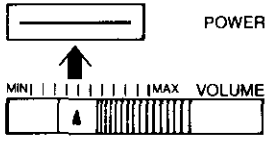
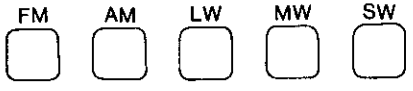
SELECTING A BAND AND TURNING ON POWER

The radio has five band select buttons beneath the EXECUTE button.



Band (Button)	Frequency Min	Max		Service
FM	87.5	108	MHz	Normal FM broadcasts
AM	150	29999	kHz	Entire AM Band
LW	150	281	kHz	Longwave
MW	520	1620	kHz	Normal AM broadcasts
SW	2300	26100	kHz	Shortwave in 12 sub-bands

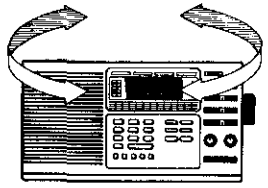
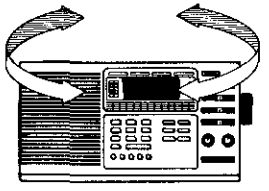
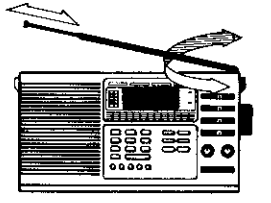
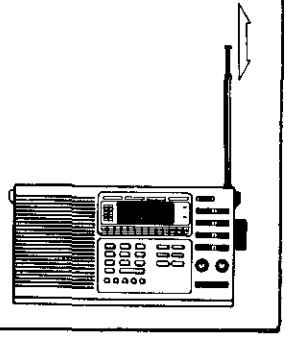
Note: Each time you select SW, the radio steps through 12 sub-bands, each band covering as little as 100 kHz to as much as 500 kHz. The sub-bands correspond to the wavelengths of each band. Refer to "The Shortwave Hobby" section for additional information.

1. Press the POWER button. The POWER indicator lights. The display shows the last band and frequency you selected.	
2. Press the band button of your choice. The display shows the band you selected and a random frequency within that band.	

TUNING THE RADIO

ADJUSTING THE ANTENNA

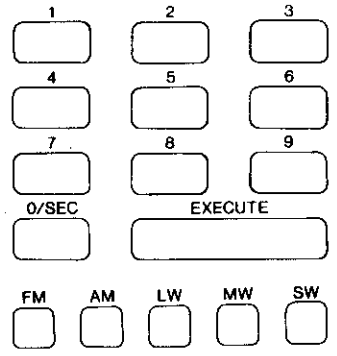
Locate the band to which you want to listen in the following chart. Adjust the antenna as indicated.

BAND	FREQUENCY RANGE	ANTENNA	
MW	520 - 1620 kHz	Internal - Rotate radio for best reception	
LW	150 - 281 kHz	Internal - Rotate radio for best reception	
FM	87.5- 108 MHz	Telescopic - Extend fully Swivel for best reception	
AM/SW	2300 - 26100 kHz	Telescopic - Extend fully Do not swivel	

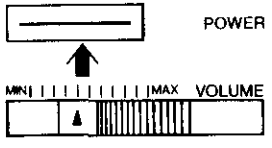
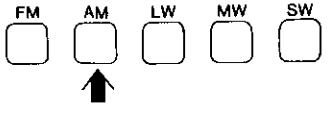
You can select a frequency using four tuning methods:

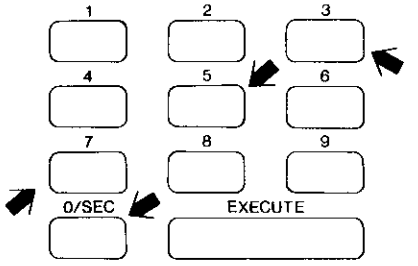
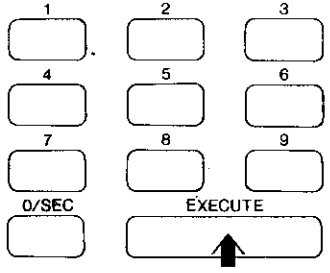
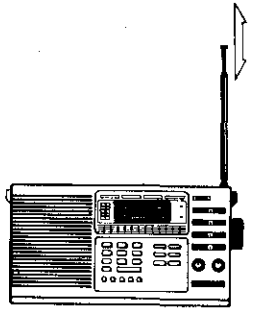
- Direct Tuning
- Manual Tuning
- Scan Tuning
- Memory Tuning

DIRECT TUNING

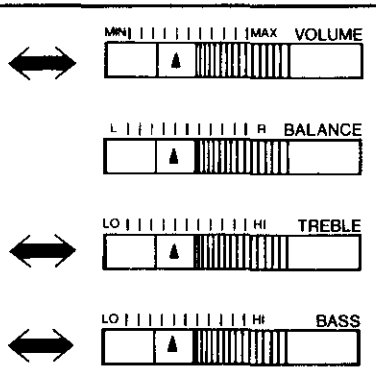
You can "key in" any frequency within the range of the radio by selecting the band in which that frequency operates and then pressing the number buttons of that frequency.	

Example: To tune to 7305 kHz on the AM band

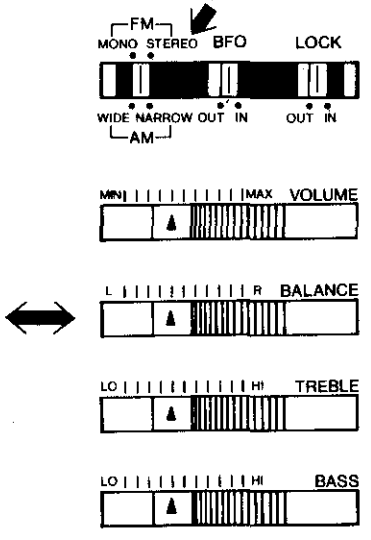
1. Press the POWER button to turn on the radio.	
2. Press the AM band button.	

3. Press [7], [3], [0], [5]. As you press each button, the LCD shows the number.	
4. Press the EXECUTE button within five seconds. The display shows the frequency and meter band of SW. 	
5. Extend the antenna fully stranght up. for the best AM (SW) reception.	

6. Adjust the VOLUME and TREBLE/ BASS tone controls for the desired sound level.

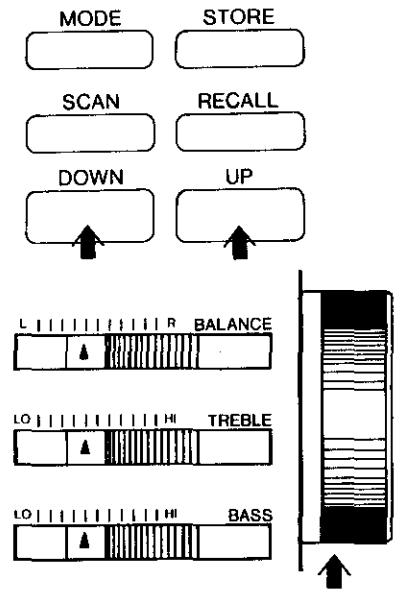


Note: If you select the FM band and tune to an FM stereo station, move the FM mode switch to STEREO and adjust the BALANCE control for the best stereo headphone reproduction.
The built in speaker is monaural. For the best sound result when listening with the built in speaker, do not forget to return the BALANCE control to the mid position.

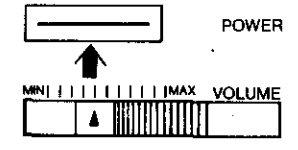


CONTINUOUS TUNING

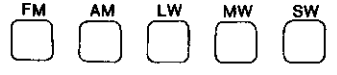
If you do not know the exact frequency of the station you want to listen to, you can check the broadcasts on a band using the UP/DOWN buttons or the tuning knob.



1. Press the POWER button to turn on the radio.

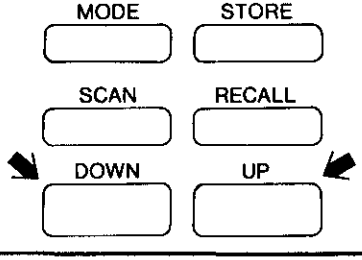


2. Select a band.

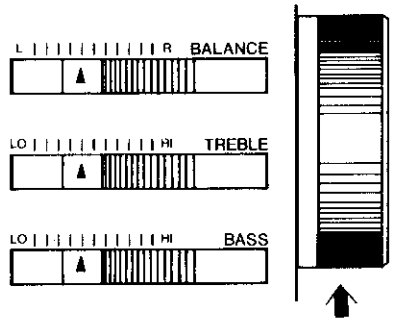


3. a. Repeatedly press the UP or DOWN button until you reach the frequency you want or reach a station you want to listen to. Press and hold the UP or DOWN buttons to rapidly change frequencies.

   or



b. Rotate the tuning knob in either direction until you reach a desired frequency or station with all five SIGNAL indicators light to obtain best reception.

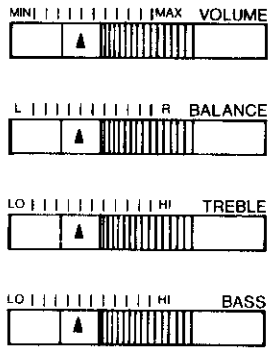


Note :
When you repeatedly press an UP or DOWN button, the frequency on the FM band changes by .05 MHz each time you press a button. On all other bands, the frequency changes by 1 kHz.

When you press and **hold** an UP or DOWN button, the frequency on the FM band changes by .50 MHz. On all other bands, it changes by 10 kHz.

When you turn the TUNING knob slowly in the AM band, the display changes in 1 kHz increments. Slightly faster turning of the knob causes the display to change in 10 kHz and very fast turning of the knob causes changes in 100 kHz increments. Turn the knob quickly until the display nears the desired frequency. Then, turn it slowly for precise tuning.

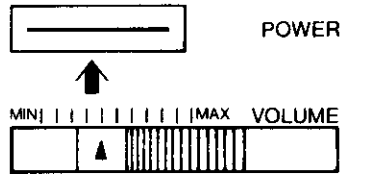
4. Adjust the VOLUME,TREBLE,BASS and BALANCE



SCAN TUNING

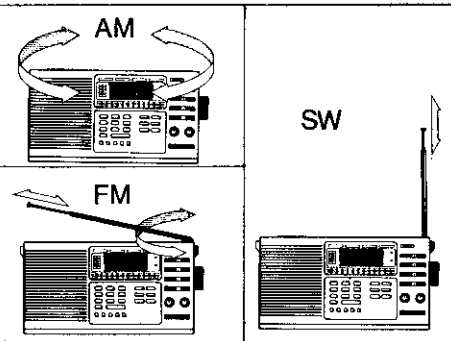
Use scan tuning to quickly locate a station or to monitor several stations within a band.

1. Turn on the radio.

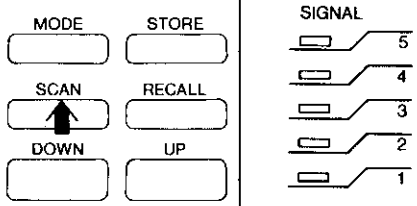


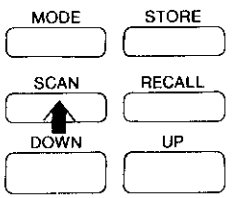
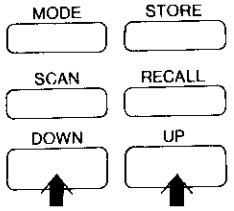
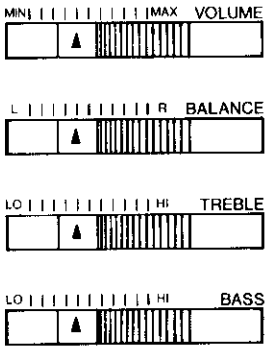
2. Select a band.

3. Adjust the antenna or radio position according to the chosen band.



4. Press the SCAN button. The radio begins to scan the frequencies in the band, from lowest to highest. It stops when it reaches a station. The signal strength of the station registers on the SIGNAL indicators.
When all five indicators light, SIGNAL is the best.

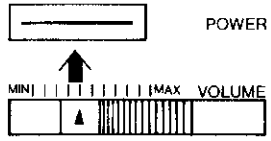
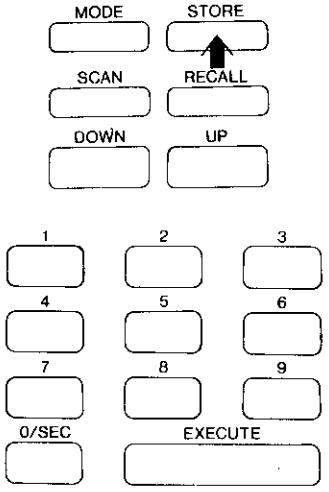


5. Press the SCAN button again to resume upward scanning. When the radio reaches the upper frequency limit of the band, it continues scanning starting again at the lowest frequency on the band.	
6. You can fine tune the station using the UP or DOWN buttons. Tune so that the most SIGNAL indicators light for best reception.	
7. Adjust the VOLUME/TREBLE/BASS and BALANCE contorls.	

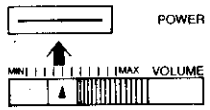
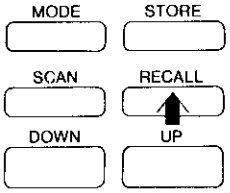
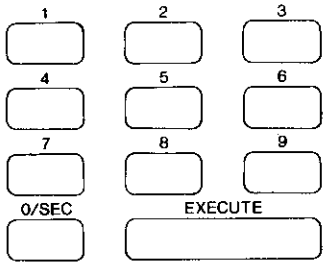
MEMORY TUNING

You can store up to nine different frequencies and have them available for instant selection.

To Store a Frequency

1. Turn on the radio.	
2. Tune to any frequency using any of the previously mentioned techniques.	
3. Press the STORE button. The word STORE flashes on the display for five seconds. During this period, press one of the nine number buttons. The display shows the storage number you selected and stores the chosen station in that memory location. **Note**: You do not have to store your first station as location 1. You can choose any location as your first choice.	

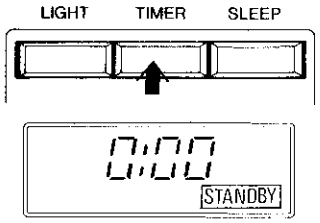
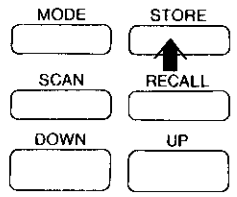
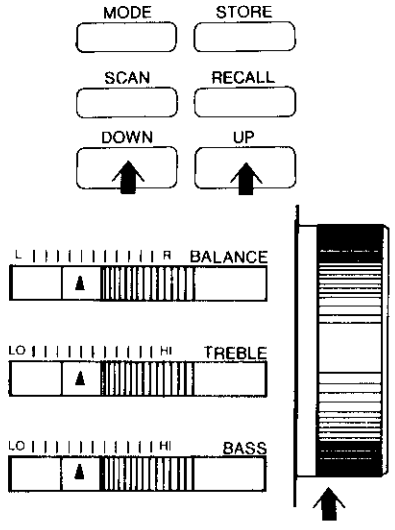
To Recall a Frequency

1. Turn on the radio.	
2. Press the RECALL button. The display flashes MEMO for five seconds.	
3. During this time, press the storage number button for the desired station. The radio instantly tunes to that station and displays the frequency and the storage number. **Note** :If you make no selection while STORE or MEMO flashes, the radio returns to the normal playing mode.	

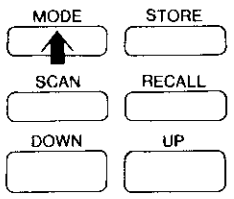
CLOCK RADIO OPERATION

You can use the DX-440 to wake you up to your favorite station everyday. And before you retire for the evening, you can set the timer so that the radio turns itself off after an interval between 10 and 90 minutes. Make the following settings with the power off.

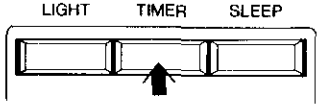
SETTING THE ALARM

1. Press the TIMER button. The display shows 0:00 and STANDBY for five seconds.	
2. During this period, press the STORE button. STANDBY starts to flash for five seconds.	
3. During this period, use the UP and DOWN buttons or the tuning knob to reach the daily turn-on time, using a 24 hour clock, displayed in hours and minutes. For example, to set the radio to turn on at 1:24 P.M. each day, use the buttons or turn the knob until the display shows 13:24.	

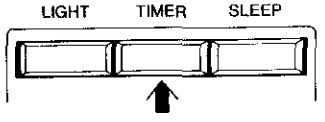
4. When you reach the desired turn on time, press the MODE button to lock the setting. STANDBY stops flashing. In a few seconds, the display reverts to the clock mode and shows the current time.



5. Press the TIMER button once. STANDBY disappears.



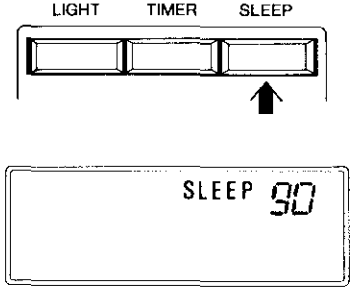
6. To check the daily turn on time, press it again to display the STANDBY TIMER all the time .



USING THE SLEEP TIMER

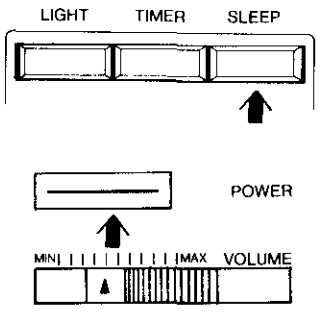
To have the radio turn itself off after a period of 90 minutes or less, proceed as follows:

1. Press the SLEEP button. The display shows SLEEP 90 in the upper right corner.



2. If you want fewer than 90 minutes playing time, press the SLEEP button again. Each time you press the button, the playing time reduces by 10 minutes.

   To turn off the radio before it normally turns itself off, press the POWER button.

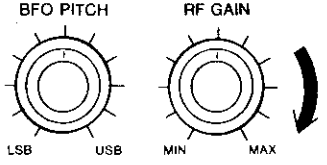


SPECIAL TUNING TECHNIQUES AND CONTROLS

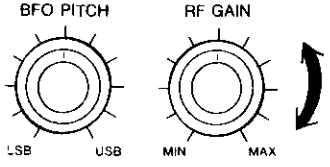
In addition to the standard tuning operations described previously, use the following controls for special operations.

RF GAIN CONTROL

This control adjusts the receiver's sensitivity. For shortwave reception, rotate the control to the MAX position. This provides the maximum sensitivity. When you listen to the MW, standard AM band, or LW band, rotate the control only as far as needed to obtain a good signal. If you turn the knob further you might hear a distorted signal. For weak stations, rotate the control to the MAX position.

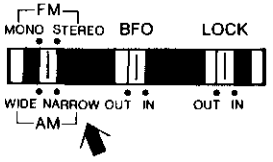


If you encounter interference, adjust the control in both directions until you obtain the best compromise between your station and the interference.

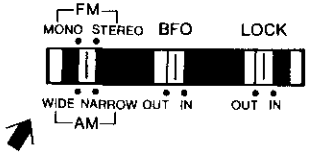


AM NARROW/WIDE SELECTIVITY SWITCH

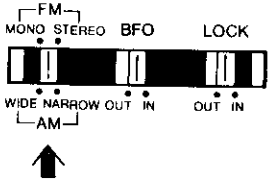
Some stations transmit their signal so that very little space exists between their airspace and the station next to them on the band. If, while tuning, you encounter interference, caused by the signal from an adjacent station, press the button for the band you are listening to and select the NARROW position. The interference is reduced or muted.



For full reception, leave the switch in the WIDE position.

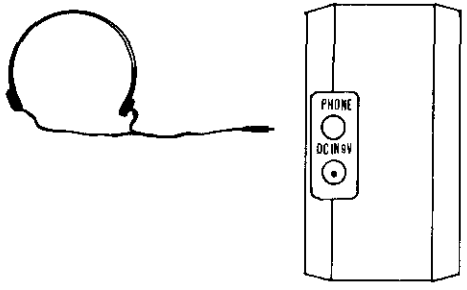


If you plan to listen to Morse code, referred to as CW (continuous wave), set the BFO switch to IN position. If you encounter too much noise as you tune, set the AM NARROW/WIDE switch to NARROW position.

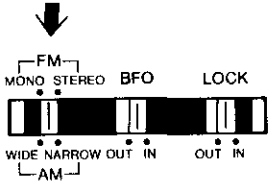


USING HEADPHONES

While not a control, you might consider using headphones to obtain the best reception. Many stations broadcast marginal signals. Only headphones can capture the subtle difference between the signal from such stations and the surrounding noise often encountered at night. Be sure that the headphones terminate in a 1/8 inch plug. Insert the plug into the PHONES jack on the side of the radio. When you plug the headphones in, you silence the speaker.



Because the radio can receive stereo FM, when you listen to FM stereo broadcasts, be sure your headphones are designed for stereo operation so that you can obtain the full benefit of this feature.

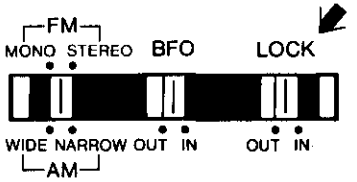


USING THE LOCK CONTROL

Use this switch to prevent unauthorized use of the radio or to ensure that any station you might be monitoring remains tuned in.

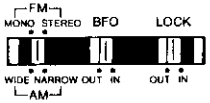
When you move the LOCK switch to the IN position, you disable the POWER button and the tuning controls. If the radio is on when you use the LOCK switch, you cannot turn off the radio or change the current frequency.

To release the LOCK function, set LOCK switch to out position

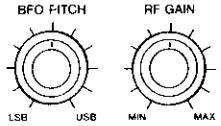


SPECIAL SSB/CW RECEPTION TECHNIQUES

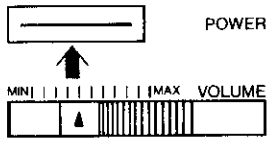
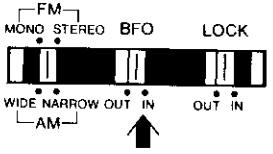
Many stations transmit unmodulated telegraph transmissions in the shortwave band. To receive these special Morse code characters, the radio uses a special circuit, a *beat-frequency oscill - ator*, to modify the transmitted signal so that you can hear it. This particular type of telegraph transmission is called *con - tinuous wave* (CW) transmission.

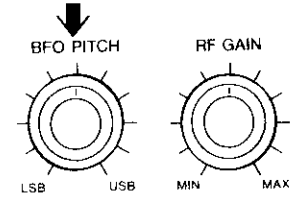
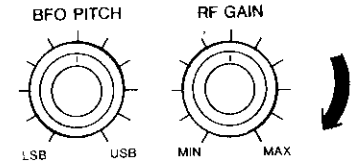
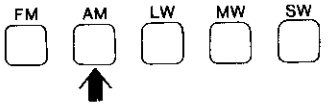
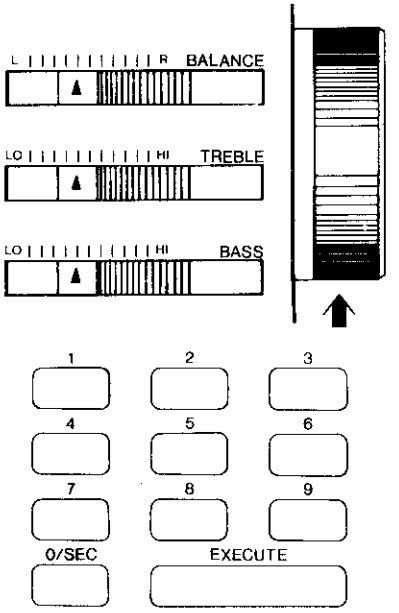


Many stations transmit voice signals with a suppressed carrier in the *single side band.*(SSB),part of the radio trans- mission spectrum that lies to the side of the primary frequency signal. Amat- eurs tend who transmit voice below 10 MHz use the *lower side band* (LSB). Above 10 MHz, they use the *upper side band* (USB). Commercial utility stations generally use the USB. A carrier has to be added to make these signals audible.

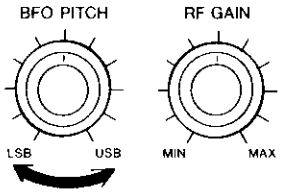


TO RECIEVE CW

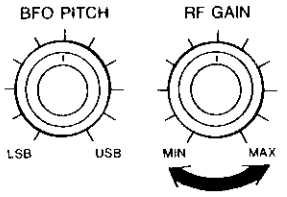
1. Turn on the radio.	
2. Extend the antenna fully straight up.	
3. Set the BFO switch to IN.	

4. Rotate the BFO PITCH control to the midpoint.	
5. Rotate the RF GAIN control to the MAX position	
6. Press the AM band button to select the AM band.	
7. Tune in the CW station using the tuning knob, or enter the frequency using the direct access buttons.	

8. Adjust the CW tone using the BFO PITCH control.

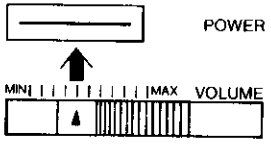


9. Reduce strong signals by using the RF GAIN control. This also reduces interference and noise.

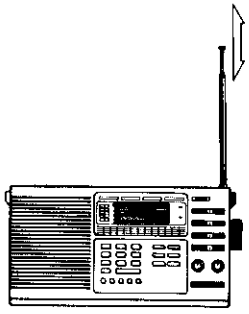


TO RECEIVE SSB VOICE

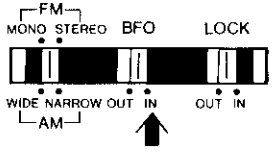
1. Turn on the radio.



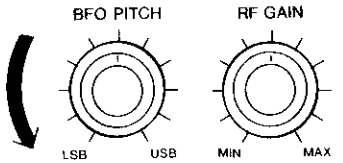
2. Extend the antenna fully, in a straight up position.



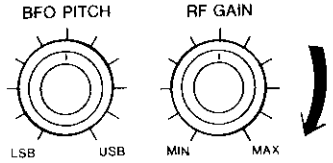
3. Set the BFO switch to the IN position.



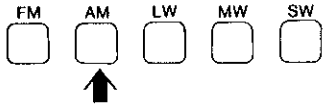
4. Rotate the BFO PITCH control to the LSB position for stations below 10 MHz or to the USB position for stations above 10 MHz.



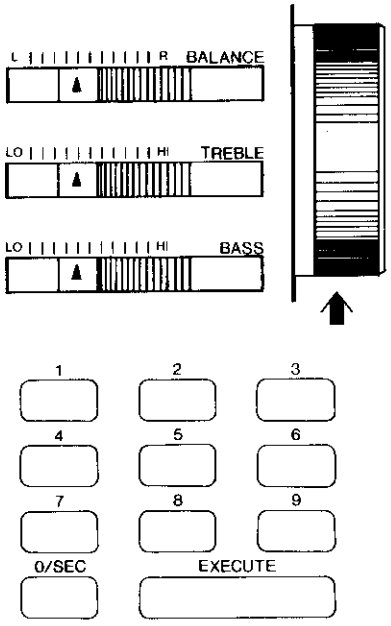
5. Rotate the RF GAIN control to the MAX position.

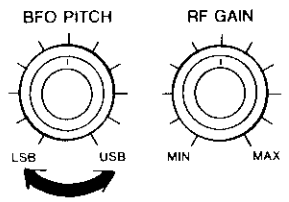
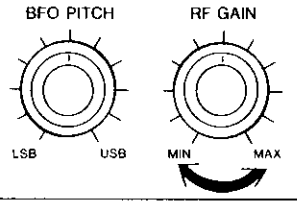
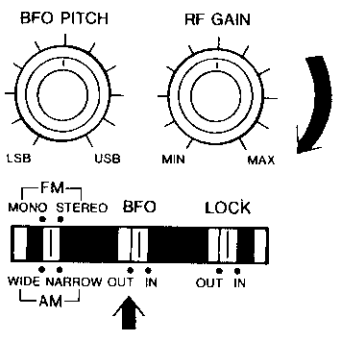


6. Press the AM button to select the AM band.



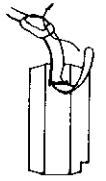
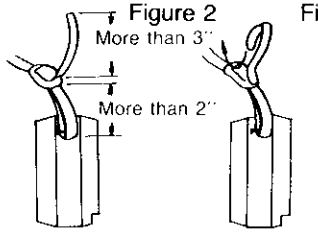
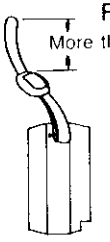
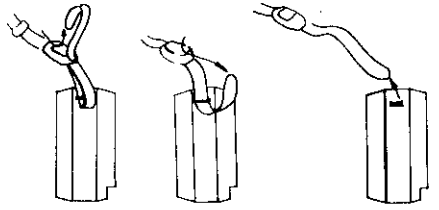
7. Tune in the SSB station using the tuning knob, or enter the frequency using the direct access buttons.



8. Rotate the BFO PITCH control to adjust the signal quality.	
9. Rotate the RF GAIN control to dampen strong signals. This can improve signal clarity as well.	
Note: Before choosing another band, set the RF GAIN control to MAX, and move the BFO switch to the OUT position.	

USING THE SHOULDER STRAP

To Attach The Shoulder Strap

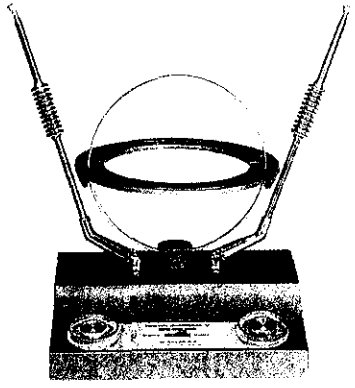
1. Insert about five inches of the end of the strap into the strap hanger.	
2. Pull the free end of the strap upward, and insert the end into the lower edge of the strap buckle as shown in Figure 1.	Figure 1 
3. Pull at least three inches of the strap end through the buckle. See Figure 2. Then bring the end of the strap beneath the upper end of the buckle. Refer to Figure 3.	Figure 2 More than 3" More than 2" Figure 3 
4. Pull the free end taught. Be sure that at least two inches of strap extend from the upper end of the buckle. Slip the extra strap beneath the belt loop. See Figure 4.	Figure 4 More than 2" 
To remove the shoulder strap, follow Figures 5, 6, and 7 to reverse the procedure.	Figure 5 Figure 6 Figure 7 

CHOOSING AN ANTENNA

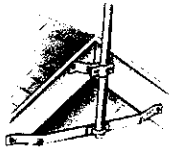
The radio uses a telescoping antenna and an internal ferrite bar antenna for reception of signals between 150 kHz and 1620 kHz. These antennas provide acceptable reception for most situations. However, if you use an external antenna, you can receive more signals, and the signals you receive will be better.

FM BAND

- Use a set of VHF-TV rabbit ears. Those made for TV/FM coverage can help get better performance on the FM band.



- Use an outdoor FM antenna. This type, specially designed for optimum FM performance, requires rooftop (or similar location) mounting.



- Use a combination TV/FM antenna.

Note

- To use an external antenna, equipped with 300-ohm twinlead, connect the twinlead's terminals to a 300 to 75-ohm matching transformer, Cat. No. 15-1253. Then insert the 75-ohm connector of the transformer into an F-to-RCA adapter, Cat. No. 278-252. Finally, insert the RCA type plug of the adapter into the RCA antenna jack of the receiver. Be sure to move the antenna switch to EXT.
- If your antenna uses 75 ohm coaxial cable, attach the connector of the cable to Cat. No. 278-252, which also terminates in a RCA type plug. Insert the RCA plug into the ANT jack, and move the switch next to the jack to EXT.

AM - SHORTWAVE BANDS

For AM reception, you can use many different types of antennas. Unfortunately, no single antenna can effectively cover the entire frequency range of the DX-440, from 150 kHz to 29999 kHz.

A general purpose shortwave antenna, such as Cat. No. 278-758, can provide better reception than either of the built-in antennas. However, if you want the best possible reception on one specific band, your antenna must be a certain length.

Refer to the following charts. The first chart indicates the length of wire required for optimum performance on the specified band. The second chart gives you the required length of wire to receive the amateur radio operator's bands.

Frequency			Antenna Wire Length (feet)	
150 kHz	-	500 kHz	1440	Lengths generally
520 kHz	-	1600 kHz	441	impractical to erect
1600 kHz	-	4500 kHz	153	
4500 kHz	-	12000 kHz	57	
12000 kHz	-	29999 kHz	22	

Wave Length - Ham Band	Antenna Wire Length (feet)
160 meter	246
80 meter	117
40 meter	66
20 meter	33
15 meter	22

To calcuate antenna length for a specific frequency

You can determine the exact length of wire you need for a specific frequency using the following information. Then, obtain bare copper wire, stand-off insulators, and an appropriate length of lead-in wire. Be sure to use a static discharge unit to guard against lightning damage. For complete information, refer to *The Radio Amateur Handbook,* published by the American Radio Relay League.

This formula results in a half-wave antenna.

$$\text{Length of a 1/2 wave antenna} = \frac{468000}{\text{Desired Frequency (kHz)}}$$

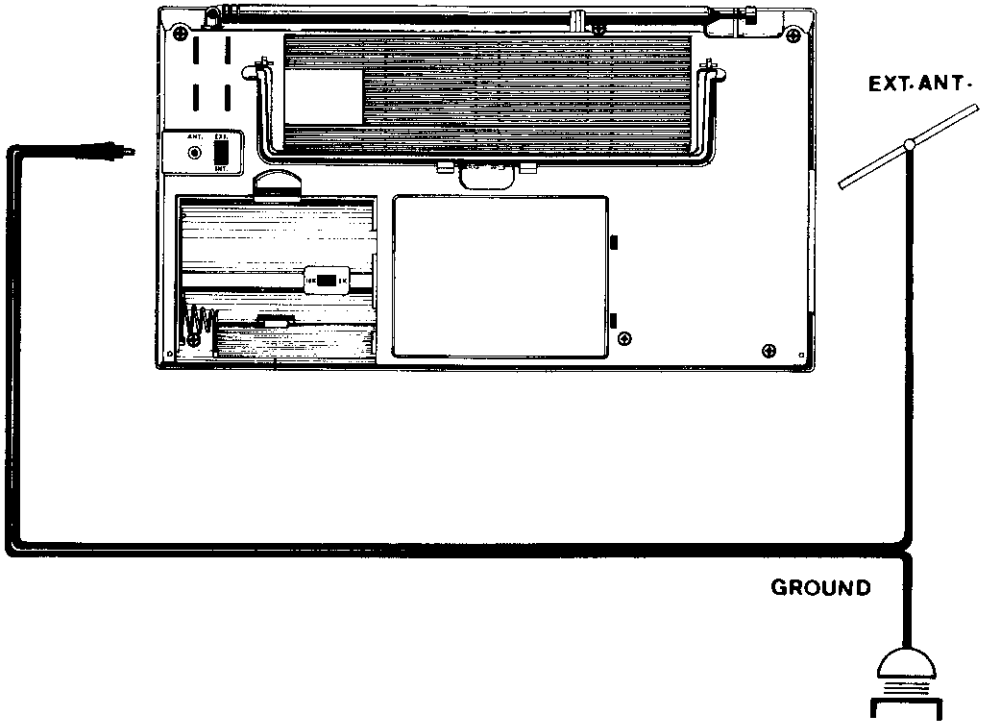
For example, to pick up international shortwave signals in the 19 meter band, 15100 to 15600 kHz, pick a representative frequency, such as 15350 kHz. The formula then becomes:

$$\frac{468000}{15350} = 30\ 1/2 \text{ feet}$$

SYSTEM GROUNDING

To ensure the best reception, always connect a ground wire to the external antenna jack. Connect the single wire lead-in to the center terminal of the RCA plug. Connect a suitable earth ground to the outer terminal of the plug.

A suitable earth ground can be a clamp around a metal water pipe or a copper rod driven several feet into the earth. Radio Shack sells a copper ground rod (Cat. No. 15-530) and the appropriate hardware.



BAND ALLOCATION

To avoid interference and confusion, certain portions of the radio spectrum have been set aside for specific purposes. Perhaps the most familiar example is 540 - 1600 kHz, the standard AM broadcast band.

Ham radio operators use the following bands:

160 meters = 1,800 - 2,000 kHz
80 meters = 3,500 - 4,000 kHz
40 meters = 7,000 - 7,300 kHz
20 meters = 14,000 - 14,350 kHz
15 meters = 21,000 - 21,450 kHz
10 meters = 28,000 - 29,700 kHz

International broadcasting stations have several bands set aside for them:

49 meters = 5,800 - 6,200 kHz
41 meters = 7,100 - 7,500 kHz
31 meters = 9,500 - 9,900 kHz
25 meters = 11,650 - 12,050 kHz
19 meters = 15,100 - 15,600 kHz
16 meters = 17,550 - 17,900 kHz
13 meters = 21,450 - 21,850 kHz
11 meters = 25,600 - 26,100 kHz

Note that broadcasts and hams share 7,100 - 7,300 kHz, and interference is heavy in that range.

Broadcasts in tropical regions have special bands set aside for them. In such areas shortwave is the only way to reach isolated locations:

120 meters = 2,300 - 2,500 kHz
90 meters = 3,200 - 3,400 kHz
75 meters = 3,900 - 4,000 kHz
60 meters = 4,750 - 5,060 kHz

The rest of the shortwave range is filled with marine, aeronautical and military stations. Such stations usually use either SSB or CW, and can be found outside the amateur and broadcast bands.

THE SHORTWAVE HOBBY

Shortwave listening is a hobby with thousands of participants worldwide. While no special knowledge is required for SWL, you will find your enjoyment increases with experience and special techniques for listening.

Random tuning on your DX-440 is a good idea if you've never owned a Communications Receiver before. In this way you can get acquainted with the various bands and the stations that can be heard. But after you've been listening for a while you'll discover that you can get more enjoyment by organizing your listening efforts.

Doing a little bit of library research can increase your skill as a SWL. Read up on radio propagation and theory; try to understand the conditions which make long distance reception possible. In your local library you can find such valuable references as the World Radio Television Handbook and the Radio Amateur's Handbook. Current intormation can be found by consulting periodicals dealing with communications and electronics.

Keep up to date on news events around the world. There's much interesting listening just tuning to the international service of a nation where an important event is taking place.

Ham radio operators can be found in the bands listed in our Band Allocations section. You'll find that hams mainly use Morse code (or CW, as they refer to it) and SSB. The ham bands are divided up into CW and SSB sections in the following manner:

3,500 - 3,800 kHz: CW
3,800 - 4,000 kHz: SSB
7,000 - 7,150 kHz: CW
7,150 - 7,300 kHz: SSB
14,000 - 14,200 kHz: CW
14,200 - 14,350 kHz: SSB
21,000 - 21,250 kHz: CW
21,250 - 21,450 kHz: SSB
28,000 - 28,500 kHz: CW
28,500 - 29,700 kHz: SSB

These boundaries are not precisely observed everywhere in the world, so don't be too surprised to find an SSB signal in the CW portion of a band and vice-versa.

Some of the ranges where aircraft may be flying international routes use shortwave for their communications. Most transmissions are in SSB, although some AM is still heard. Some of the ranges where aircraft can be heard include:

4,650 - 4,750 kHz
6,545 - 6,765 kHz
8,815 - 9,040 kHz
10,000 - 10,100 kHz
11,175 - 11,400 kHz
13,200 - 13,360 kHz
15,010 - 15,100 kHz
17,900 - 18,030 kHz

Ships and coastal stations can also be heard on shortwave. Most communications are in SSB and CW. One interesting range is 2,000 - 2,300 kHz, where the Coast Guard and many small boats can be heard. One frequency to watch is 2,182 kHz, which is an international distress and emergency channel. Other bands in which to tune for ships are:

4,063 - 4,139 kHz
4,361 - 4,438 kHz
8,195 - 8,181 kHz
12,330 - 12,420 kHz
13,107 - 13,200 kHz
16,460 - 16,565 kHz

LISTENING NOTES

If you have never tuned a shortwave receiver before, you may be a bit confused by the wide variety of signals that can be heard. To help you find your way around the bands, here is a summary of what to expect.

The 150 - 540 kHz range is known as the long wave band. You'll find reception here best at night in your location. The majority of stations use Morse code, although you will hear AM used for weather broadcasts. The largest number of stations in this range are beacons for aircraft and marine navigation. Beacons transmit their call letters continuously in Morse code at a slow speed.

A manual on air or marine navigation, available from your public library or a marine supply store, will contain lists of these beacons and their locations. Weather broadcasts on AM often identify themselves by their location instead of by call letters (such as "New Orleans Radio"). Many ship stations also use this range, with 500 kHz set aside by international agreement for distress and emergency calls.

International broadcast stations can be found in the bands indicated in our section on Band Allocations. Many such stations operate in English, and often can be heard during the evening hours (between 6:00PM and Midnight, your local time). Programming usually consists of news, commentaries, local music, and features on life in their respective countries. Among the stations that are listener favorites worldwide are Radio Japan, the British Broadcasting Company, Israel Radio, Radio Nederland in Holland and Radio Australia. You'll soon discover which stations will be your personal favorites.

In tropical areas of the world, static makes reception on the standard AM broadcasting band very difficult. This has resulted in special Tropical Bands set aside for nations located in tropics. Programming here is intended for local audiences and much of what can be heard is a treat - exotic languages, beautiful and unusual music, etc. Some English can be heard, however, from stations in Africa or the Pacific.

You'll find time standard stations quite useful. These stations give out the exact time of day at specified intervals. The National Bureau of Standards operates station WWV in Fort Collins, Colorado on 2,500, 5,000, 10,000, 15,000, and 20,000 kHz. A man's voice gives the time each minute along with periodic reports on shortwave reception conditions. The National Bureau of Standards also operates another station, WWVH, on the same frequencies as WWV, in Hawaii. WWVH uses a woman's voice to give the time. Sometimes you can hear these two stations simultaneously. Other time standard stations are Canada's CHU on 3,330, 7,335 and 14,670 kHz and VNG in Australia on 4,500 and 12,000kHz. Several other nations have similar stations.

FREQUENCY CONVERSION

Your communications receiver is calibrated in Megahertz (MHz) and Kilohertz (kHz) - as most communications-type receivers are. You should be familiar with these terms:

Megahertz: Millions-of-hertz (or cycles-per-second). A Megahertz is 1,000,000 hertz (Hz for short) or 1,000,000 cycles-per-second. Mega means million.

Kilohertz: Thousands-of-hertz·A kilohertz is 1,000 hertz. We use the abbreviation kHz. Kilo means thousand.

Meter: The term meter, as applied to shortwave listening, refers to the wavelength of a radio frequency. In many parts fo the world, frequencies are listed in meters, for example, international shortwave stations in the 19 Meter band. European radio equipment and stations often refer to the wavelength of a station or band (in meters), rather than frequency (in MHz or kHz).

The relationship of these three terms is:
1 MHz (million) = 1,000kHz (thousand)
To change 9.62 MHz to kHz. we multiply by 1000.

$$9.62 \times 1000 = 9620 \text{ kHz}$$

To go the other way, from kHz to MHz, divide by 1000, A station at 3780 kHz is

$$\frac{3780}{1000} = 3.780 \text{ MHz}$$

To convert MHz to meters, use this formula:

$$\text{Meters} = \frac{300}{\text{MHz}}$$

Example: What is the wavelength of 7.1 MHz?

$$\frac{300}{7.1 \text{ MHz}} = 42.25 \text{ meters}$$

COUNTRY LOG

The following listing contains some of the more frequently heard stations on shortwave. The stations listed can be heard throughout the North American Continent. All stations operate in English unless otherwise specified. Most of these stations do not broadcast continuously.

Obviously, reception will vary on the different frequencies according to the time of day and season of the year. Remember that reception from different parts of the world varies with the time of day and the frequency to which your DX-440 is tuned. Consult the section on Changes in Reception for a more detailed explanation of these variations.

Remember also that the 7,000 - 7,300 kHz range is shared by hams and international broadcasts; consequently, interference is severe in that range.

While every effort has been made to ensure the accuracy of this list, stations can and do change frequencies. Check periodicals on communications and electronics for more current information on station frequencies and schedules.

This list only contains broadcasting stations which operate on fixed frequencies with regular schedules. Ham military, marine and aeronautical stations operate on varied frequencies with irregular schedules.

These listings can change at any time and are here for your reference only.

No attempt has been made to provide an accurate up-to-date listing. For a yearly up-to-date listing, check the *world radio television hand book.*

kHz	STATION	LOCATION	REMARKS
3,223	Radio SR	Swaziland	
3,265	Radio Mozambique	Maputo, Mozambique	Programs in Portuguese
3,300	Radio Cultural	Guatemala City, Guatemala	Religious Programs
3,380	Radio Iris	Esmeraldas, Ecuador	Programs in Spanish
3,385	FR3	Cayenne, French Guiana	Programs in French
3,396	Radio Kaduna	Kaduna, Nigeria	
4,750	Radio Bertoua	Bertoua, Cameroon	
4,755	Imo Regional Radio	Imo, Nigeria	
4,777	Radio-TV Gabon	Libreville, Gabon	Programs in French
4,795	Radio Nueva America	La Paz, Bolivia	Programs in Spanish
4,820	Radio Paz y Bien	Ambala, Equador	Programs in Spanish
4,832	Radio Reloj	San Jose, Costa Rica	Programs in Spanish
4,855	Radio Clube do Para	Belem, Brazil	Programs in Portuguese
4,890	National Broadcasting Commission	Port Moresby, Papua New Guinea	
4,915	Voice Kenya	Nairobi, Kenya	
4,920	AustralianBroadcasting Commission	Brisbane, Australia	
4,945	Radio Colosal	Neiva, Colombia	Programs in Spanish
4,965	Radio Santa Fe	Bogota, Colombia	Programs in Spanish
4,980	Ecos del Torbes	San Cristobal,Venezuela	Programs in Sapnish
4,990	Radio Barquisimeto	Barquisimeto,Venezuela	Programs in Spanish
5,020	Solomon Islands Broadcasting Service	Honiara, Solomon Islands	
5,057	Radio Gjirokaster	Gjirokaster, Albania	Programs in Albanian
5,950	Guyana Broadcasting Service	Georgetown, Guyana	
5,954	Radio Casino	Puerto Limon,Costa Rica	
5,960	Radio Canada International	Montreal, Canada	
5,980	Radio RSA	Johannesburg, South Africa	
6,005	CFCX	Montreal, Canada	
6,025	Radio Malaysia	Kuala Lumpur, Malaysia	Programs in Chinese
6,045	Radio Australia	Lyndhurst, Australia	
6,055	Nihon Shortwave Broadcasting Company	Tokyo, Japan	Programs in Japanese

6,060	Radio Nacional	Buenos Aires, Argentina	Programs in spanish
6,075	Radio Sutatenza	Bogota, Colombia	Programs in Spanish
6,090	Radio Luxembourg	Ville Louvigny, Luxembourg	
6,095	Polskie Radio	Warsaw, Poland	
6,105	Radio New Zealand	Wellington, New Zealand	
7,140	Trans World Radio	Monte Carlo Monaco	
7,170	Radio Noumea	Noumea, New Caledonia	Programs in French
7,300	Radio Tirana	Tirana, Albania	
9,475	Radio Cairo	Cairo, Egypt	
9,515	Voice of Greece	Athens, Greece	
9,525	Radio Korea	Seoul, South Korea	
9,530	Spanish Foreign Radio	Madrid, Spain	
9,535	Swiss Radio International	Berne, Switzerland	
9,540	Radio Prague	Prague, Czechoslovakia	
9,570	Radio Bucharest	Bucharest, Rumania	
9,575	Italian Radio and Television Service	Rome, Italy	
9,610	Radio-TV Algeria	Algiers, Algeria	Programs in Arabic
9,620	Radio Berlin International	Berlin, East Germany	
9,645	Radio Norway	Oslo, Norway	
9,720	Radio Iran	Tehran, Iran	Programs in Farsi
9,745	HCJB	Quito, Equador	
9,770	Austrian Radio	Vienna, Austria	
9,800	Radio Kiev	Kiev, USSR	
9,835	Radio Budapest	Budapest, Hungary	
10,040	Voice of Vietnam	Hanoi, Vietnam	
11,655	Israel Radio	Jerusalem, Israel	
11,690	Radio Kuwait	Kuwait, Kuwait	
11,705	Radio Sweden	Stockholm, Sweden	
11,720	Radio Moscow	Moscow, USSR	
11,735	Radio Sofia	Sofia, Bulgaria	
11,745	Voice of Free China	Taipei, China	
11,815	Radio Japan	Tokyo, Japan	
11,825	Radio Tahiti	Papeete, Tahiti	Programs in Tahitian
11,835	4VEH	Cap Haitien, Haiti	
11,845	Radio Canada International	Montreal, Canada	

11,850	Deutsche Welle	Cologne, West Germany	
11,890	Voice of Chile	Santiago, Chile	
11,900	Radio RSA	Johannesburg, South Africa	
11,910	BBC	London, England	
11,930	Radio Havana Cuba	Havana, Cuba	
11,935	Radio Portugal	Lisbon, Portugal	
11,945	Radio Peking	Peking, China	
11,955	Voice of Turkey	Ankara, Turkey	
11,980	Radio Moscow	Moscow, USSR	
15,038	Saudi Arabian Broadcasting Service	Riyadh, Saudi Arabia	Programs in Arabic
15,084	Voice of Iran	Tehran, Iran	Programs in Farsi
15,135	Radio Moscow	Moscow, USSR	
15,165	HCJB	Qiito, Ecuador	
15,190	ORU	Brussels, Belgium	
15,205	All India Radio	New Delhi, India	
15,260	BBC	London, England	
15,265	Finnish Radio	Helsinki, Finland	
15,275	Radio Sweden	Stockholm, Sweden	
15,305	Swiss Radio International	Berne, Switzerland	
15,310	Radio Japan	Tokyo, Japan	
15,320	Radio Australia	Melbourne, Australia	
15,400	BBC	London, England	
15,430	Radio Mexico	Mexico City, Mexico	Programs in Spanish
15,465	Radio Pakistan	Islamad, Pakistan	Programs in Urdu
17,720	Radio France International	Paris, France	
17,825	Vatican Radio	Vatican City	
17,860	Austrian Radio	Vienna, Austria	
21,495	Israel Radio	Jerusalem, Israel	
21,525	Radio Australia	Melborne, Australia	
21,625	Israel Radio	Jerusalem, Israel	
21,645	Radio France International	Paris, France	
21,735	Radio-TV Morocco	Rabat, Morocco	Programs in Arabic
25,650	BBC	London, England	
25,790	Radio RSA	Johannesburg, South Africa	

TROUBLESHOOTING

The DX-440 is a ruggedly built electronic unit with all parts conservatively rated. However, you should treat it with care; don't subject it to excessively rough handling. You will find it will give you long life enjoyment if kept free from excessive humidity.

If you have problems—(we hope you don't),—check the following:

FREQUENCY DISPLAY

No/incorrect display
- Weak microprocessor or radio batteries.
- Microprocessor fails to initialize. This may happen when you first install (or replace) batteries. Remove the microprocessor batteries, wait for about one minute, and re-install.

Display is dim
- Weak microprocessor or radio batteries.
- Environment is inappropriate for operation; temperature is too high or too much humidity.

RADIO

No sound
- Check the VOLUME control setting.
- Headphone jack is plugged in.
- Weak radio batteries.
- AC adapter cord not firmly plugged.
- DC power cord is not correctly inserted into cigarette lighter socket in vehicle operation.
- AC jack or external DC jack is plugged in when trying to operate on batteries.

Weak or intermittent sound
- Weak radio batteries.
- Antenna adjustment insufficient.
- Weak signal. Try moving the unit near a window when operating inside a vehicle or in a metal frame building.
- Tuning slightly off-frequency. Use UP or DOWN key to fine tune.

Frequency cannot be keyed in when direct tuning.
- EXECUTE was not pressed within 5 seconds.
- Microprocessor failed to initialize. Remove the microprocessor batteries, wait one minute and re-install.

Scanning or memory frequency cannot be keyed in
- EXECUTE was not pressed after the frequency was keyed in.

Will not scan on AM
- Limit frequencies are not keyed in.

Scanning stops where there is no clear signal
- Birdies—the internally generated signals mixed with external signals. A telescopic antenna is likely to pick up these undesirable signals; use an outdoor antenna.

A few of the most common birdies are:

455 kHz	3,844 kHz	9,000 kHz
10,245 kHz	18,000 kHz	20,490 kHz
21,835 kHz	21,868 kHz	

Scanning does not stop automatically
- Weak signal.
- RF GAIN is not set to MAX

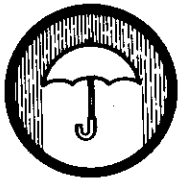
Memorized frequency cannot be recalled
- Wrong band is set. Switch bands.
- Memory has been erased. Re-enter the frequency.

SLEEP does not function
- The SLEEP button is not pressed
- The power switch is set to on

If none of the above suggested remedies solves the problem, return your set to your nearby Radio Shack store for assistance.

CARE AND MAINTENANCE

Your DX-440 is an example of superior design and craftsmanship. The following suggestions will help you care for the DX-440 so that you can enjoy it for years.

Keep the product dry. If it does get wet, wipe it dry immediately. Liquids might contain minerals that can corrode the electronic circuits.	
Use and store the product only in normal temperature environments. High temperatures can shorten the life of electronic devices, damage batteries, and distort or melt plastic parts.	
Handle the product gently and carefully. Dropping it can damage circuit boards and cases and can cause the product to work improperly.	
Keep the product away from dust and dirt, which can cause premature wear of parts.	

Wipe the product with a dampened cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the product.	
Use only fresh batteries of the recommended size and type. Always remove old or weak batteries. They can leak chemicals that destroy electronic circuits.	
Modifying or tampering with the product's internal components can cause a malfunction and might invalidate the product's warranty. If your product is not performing as it should, take it to your local Radio Shack store. Our personnel can assist you and arrange for service if needed.	

SPECIFICATIONS

Semi conductors:
1 pc. LSI
7 pcs. ICs
8 pcs. FETs
44 pcs. Transistors
59 pcs. Diodes
7 pcs. LEDs

Circuit:

FM	superheterodyne
AM(LW,MW,SW)	Dual conversion superheterodyne

Frequency range:

FM:	87.5MHz - 108MHz
AM:	150 kHz - 29999 kHz
LW:	150kHz - 281kHz
MW:	520kHz - 1620kHz
SW:	divided into 12 shortwave bands
	120M 2300kHz - 2500kHz
	90M 3200kHz - 3400kHz
	75M 3900kHz - 4000kHz
	60M 4750khz - 5060 kHz
	49M 5800kHz - 6200kHz
	41M 7100kHz - 7500kHz
	31M 9500kHz - 9900kHz
	25M 11650kHz - 12050kHz
	19M 15100kHz - 15600kHz
	16M 17550kHz - 17900kHz
	13M 21450kHz - 21850kHz
	11M 25600kHz - 26100kHz

Antennas:

LW/MW	Built in ferrite bar antenna.
SW	Swivel telescopic antenna.
	External antenna terminal.
FM	Swivel telescopic antenna.
	External antenna terminal. (Not apply to W. Germany)

Output: 1200mW (10% THD)

Jacks:
1. DC jack for external power (9V)
2. Headphones Jack - 3.5ϕ for mini stereo headphones.

Power sources:
1. For Power when not playing radio :
   (AA size) penlight battery such as Radio Shack 23-552 or 23-582 (not supplied) for memory/clock back-up (3V).
2. For Power to play radio :
   a. (D size) battery such as Radio Shack 23-550 or 23-580 (not supplied) x 6pcs. (9V)
   b. AC adaptor 9V/400mA center negative

Dimension: $11\frac{1}{2}'' \times 6\frac{3}{10}'' \times 2\frac{9}{25}''$ (292mm x 160mm x 60mm)

Weight: 1.7kg. (3.75 lbs or 60 oz) without batteries.

Accessories: Shoulder strap

ADDENDUM

Cat. No. 20-221A

DX-440
AM/FM DIRECT ENTRY
COMMUNICATIONS RECEIVER

The following specifications for sensitivity, image rejection, and selectivity are provided for your reference:

Sensitivity:

(for 20 dB Signal-to-Noise ratio):

AM	150	kHz	1260	μV/m
	300	kHz	560	μV/m
	600	kHz	320	μV/m
	1.4	MHz	280	μV/m
	3.1	MHz	4	μV
	7.1	MHz	4	μV
	15.1	MHz	4	μV
	28.1	MHz	4	μV

(for 10 dB Signal-to-Noise ratio):

SSB	150	kHz	100	μV/m
	300	kHz	40	μV/m
	600	kHz	25	μV/m
	1.4	MHz	22	μV/m
	3.1	MHz	0.4	μV
	7.1	MHz	0.4	μV
	15.1	MHz	0.4	μV
	28.1	MHz	0.4	μV

(for 30 dB Signal-to-Noise ratio):

FM 87.5 to 108 MHz 4 μV

(to be continued on the back)

Image Rejection Ratio:

AM/SSB	150	kHz	48	dB
	300	kHz	65	dB
	600	kHz	65	dB
	1.4	MHz	60	dB
	3.1	MHz	60	dB
	7.1	MHz	60	dB
	15.1	MHz	60	dB
	28.1	MHz	60	dB

FM 87.5 to 108 MHz 40 dB

Selectivity: AM/SSB		– 6dB	– 50dB
	Wide	± 3	± 7 kHz
	Narrow	± 2	± 4 kHz
IF AM/SSB/CW	1st	55.845	MHz
	2nd	450	kHz
FM		10.7	MHz

Frequency Stability:

Within 1 kHz per hour after 60 minutes warm up.

RADIO SHACK

Fort Worth, Texas 76102